12. AC ADAPTER

UADP-0206TAZZ(VL-E37S, E307S)
UADP-0207TAZZ(VL-E37H)
UNIT No. UADP-0208TAZZ(VL-E37X)

Features

- Compact and light-weight design for easier portability.
- Automatic voltage change AC 110V to AC 240V allows the adapter usage even in your trips abroad.
- Charging function with battery pack.
- Rapid charging function to enable the charging in a shorter period of time.

Specifications

Power Requirement : AC110-240V, 50/60Hz
DC Output : DC4.5V
Power Consumption : 27.0W
Dimension (approx.) : $2^{31}/_{32}$" (W) X 2" (H) X $5\,^{5}/_{16}$" (D)
[75mm(W) X 50.5mm (H) X 135mm (D)]
Weight (approx.) : 360g

*Specifications are subject to change without notice.

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12-1. OPERATION MANUAL (UADP-0206TAZZ) (UADP-0207TAZZ) (UADP-0208TAZZ)

12-1-1. Outline

This adapter is designed as a power supply for the camcorder as well as a quick charger for the battery used in the camcorder.
As shown in the block diagram (Figure 12-1-1), the adapter consists of a separately excited switching regulator which uses the control IC and a multi-functional circuit at the secondary side.
The primary side control section and the secondary side multi-functional circuit, composed mainly of surface mounted devices, are mounted in a small portable casing for portable uses.
Available input voltage is 120 to 240V (50/60 Hz), so that this handy unit can be carried around and used all over the world.

The basic operation is controlled by the section to perform constant voltage control (designed to compare the operating voltage with the secondary side reference voltage provided at a switching power supply), and constant current control, as well as by the timer for quick battery charging, various detecting circuits, and sequence control section.
This unit, as an AC adapter, supplies constant voltage DC power through the 3-pin DC jack with a control terminal, and as a battery charger, the unit starts the quick charging when the specific battery is loaded with the DC plug unconnected.

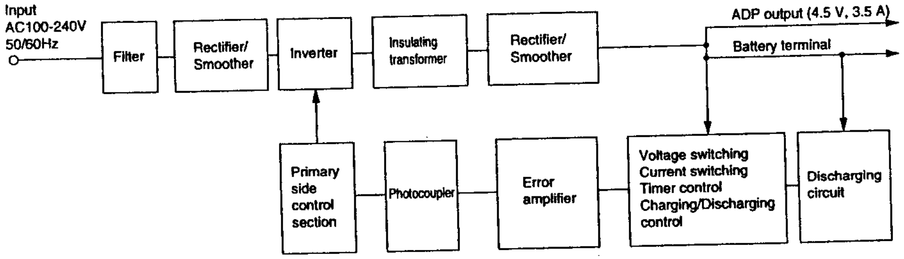

Input
AC100-240V
50/60Hz
Filter
Rectifier/ Smoother
Inverter
Insulating transformer
Rectifier/ Smoother
ADP output (4.5 V, 3.5 A)
Battery terminal
Primary side control section
Photocoupler
Error amplifier
Voltage switching
Current switching
Timer control
Charging/Discharging control
Discharging circuit

Fig. 12-1-1 Block diagram (Camcorder adapter)

12-1-2. Operation

1.Adapter mode

When the DC plug is attached to the adapter, the stable DC voltage (4.5V, 3.5A) is continuously supplied through the DC jack to operate camcorder.

The power consumption is kept constant over the whole control input range, regardless of input fluctuation.

The output is 1.3 or more times higher than rated current so that the unit can withstand transition accompanied by VTR starting current flow and rush current flow.

Also, for the adapter output, the overcurrent protector of specific characteristics ensuring power control against short-circuiting from outside is used to protect the adapter from being damaged or broken down. It also prevents the excessive heating inside the adapter.

2.Ni-Cd charge mode

This adapter, when Ni-Cd battery is attached, can be used as a quick charger. This charging operation has three operating modes which are switched successively.

The first stage is called the initial charging. A constant current 1.5A is used to charge within voltage limit (5.7V) and time limit (set by 5 min timer).

The voltage is limited in order to protect the battery against overvoltage and overcharge which may occur due to recharging of fully charged battery.

The time limit serves to prevent the charging error which may occur due to initial voltage drop of inactive battery.

The second stage is a quick charging. As with initial charging, 1.5A quick charge is performed within voltage limit (5.7V) and time limit set by the timer (180 minutes) which are different from those of the initial charging.

During quick charging, a voltage drop (-ΔV phenomenon) of the battery which occurs at the end of charging is detected, the charging is stopped, and the next stage is started.

When charging current is 1.5A, the 1500mAh battery, and the undermentioned 2600mAh nickel-hydrogen battery are fully charged for about 60 minutes and about 140 minutes, respectively.

The timer is set to 180 minutes time limit to avoid overcharge which may be caused by -ΔV detection error.

Here, -ΔV detection is set to 40 to 80mV.

The third stage is trickle charging. In this mode, the fully charged state is kept even after the quick charging is completed.

The trickle charging is generally set at 1/30 to 1/40C depending on the characteristics of battery. This adapter adopts the charging system which is controlled by the constant voltage control operation output and fixed resistance.

These charging stages are shown in Figure 12-1-2.

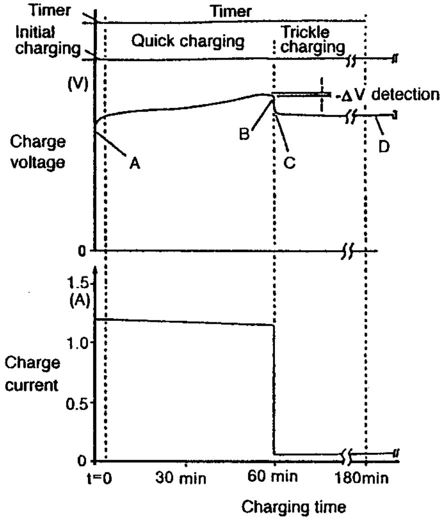


Fig. 12-1-2 Charging characteristics In case of 1500mAh Ni-Cd battery

3.Refresh mode

In order to prevent reduction of charging efficiency due to memory effect, this adapter has a function to execute the aforementioned charging operation after the provided battery is forcedly discharged to the full extent by the user switch operation.

This mode is commonly specified for the Ni-Cd battery and the undermentioned nickel-hydrogen battery.

When the refresh switch is pressed with the battery attached, a discharge current (0.3 to 0.4A) will flow out, and power will be consumed by the resistor inside the adapter.

To minimize degradation of battery, the battery discharge is ended when voltage of discharging battery reduces down to about 3.0V. Then, the charging mode is set automatically.

4.Nickel-hydrogen battery charging mode

When the nickel-hydrogen battery is attached to the adapter to which the DC plug is not attached, existence of T terminal is detected, and the quick charging of nickel-hydrogen is started.

The charging of the nickel-hydrogen battery has five operating modes. These modes are switched successively.

When the nickel-hydrogen battery is attached, the pre-charging is performed at first.

In this mode, it is charged with a constant current (about 0.5A), and the mode is switched to the next mode after 2 minutes.

Since this period is provided to activate the battery, the completion of charging is not detected. Only the battery protection functions such as overvoltage detection, abnormal temperature detection, etc. are available here.

The next operation is the initial charging as in case of Ni-Cd battery.

Differing from the Ni-Cd battery, the limit voltage of the overvoltage detection is 5.1V and an abnormal temperature detection function is provided.

The third stage is the quick charging mode, which is equivalent to the quick charging of the Ni-Cd battery.

The phenomenon detection function in this mode and the mode shift due to detection are as follows:

I) -ΔV detection
If battery voltage -ΔV (22 to 62mV) is detected, the mode is switched to the trickle charge mode.

II) Overvoltage detection
Excess of battery voltage over 5.1V is judged to be abnormal, and the mode is switched to the trickle charge mode.

III) ΔT detection
If the gradient of temperature rise of the charging battery exceeds 1°C/min., it is judged that the charging is completed soon and the mode is switched to the sub-charging mode.

IV) Abnormal temperature detection
If the battery temperature reaches 60°C to 65°C during charging, charging is stopped to protect the battery, and the mode is switched to the trickle charging mode.

V) Timer operation
When 180 minutes elapse after start of quick charging, the mode is switched to the sub-charging mode.

In the sub-charging mode which is set due to ΔT detection and timer operation in the quick charging mode, constant current (about 0.5A) charging is performed as with the pre-charging mode.

At this time, the mode is switched by -ΔV detection function, overvoltage detection function and abnormal temperature detection function as in case of quick charging. But the mode is switched to the sub-charging mode by the built-in timer when one hour elapses after the pre-charging is started.

As with the Ni-Cd battery, the trickle charging current is supplied at the constant voltage and fixed resistance in the trickle charging mode (fifth stage).

12-1-3. Circuits

The circuits used for the adapter are explained according to the circuit diagram in Figure 3.

1. Input section
The input section consists of noise filter and condenser input rectifying smoothing circuit. The noise filter, which consists of L1, C1, C26, C38, C34 and C35, reduces common mode noise.
R50 is a discharging resistor which is intended to eliminate voltage from the input plug when the power is turned off.
The rush current which is caused when the power is turned on is greatly limited by R2, DCR of L1 and the operating resistor of D1.

2. Switching section
The switching circuit drives the transistor Q1 to act as a switch by using the DC voltage rectified through C2 corresponding to the signals sent from the primary side control section. It and the transformer T1 comprise a high-frequency inverter.
C33 is a capacitor which absorbs the surge voltage generated by switching.

3. Primary side control section
This section drives the switching section by converting the pulse width of the signal sent from the secondary side control circuit through the photocoupler.
The control IC (IC4) is used to drive Q1 (Mos FET).
This IC, as an overvoltage protector, contains a function which stops oscillation when it detects the overvoltage at D8.

4. Output circuit section
For the secondary side output, a popular on-off system is applied. Ripples and common mode noise are reduced through the chokes of L2 and L4.
Q2 is a transistor for the charging switch. It is turned on through Q3 by the output of pin 6 of IC3 during quick charging and pre-/sub-charging.
D11 is used to prevent discharge troubles of the control circuit section when the input is turned off with the battery attached.

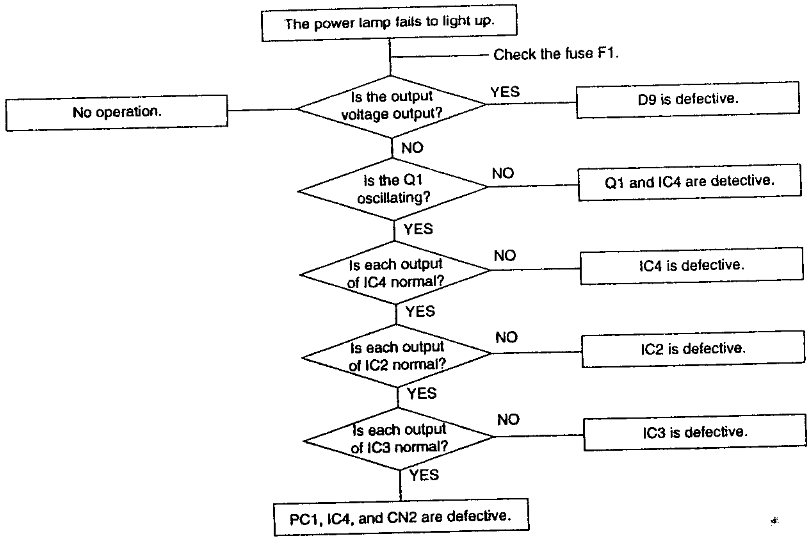
5. Battery detection circuit
When the battery is installed, SW2 is turned on by the switch knob.
If the DC plug is not attached to CN2 at this time, the GND level will be input to the pin 10 of IC3 by the transistor Q7 in order to detect the installation of the battery.

6. Secondary side control circuit
The function of the secondary side control section is to control the switching section by error-amplifying the detected output voltage and current and transmitting the signals to the primary side control circuit through the photocoupler.
The constant voltage is set and detected in IC2-II, whereas the adapter mode (4.5V)/charge mode (6.5V) selection is made by changing the reference voltage through the voltage switching operation of pin 5 of IC3.
The constant current and overcurrent protections are set and detected in IC2-I, while 1.5A/0.5A constant current selection is made through the output of pin 7 of IC3.
The overcurrent protection in the adapter mode is performed by the primary side control section.
IC1 has the constant voltage power function to provide drive power for IC3 and the reference voltage for IC2, as well as the reset function to prevent IC3 errors.
The constant voltage output of IC1 is used as a reference voltage when error amplifying of output voltage/current.

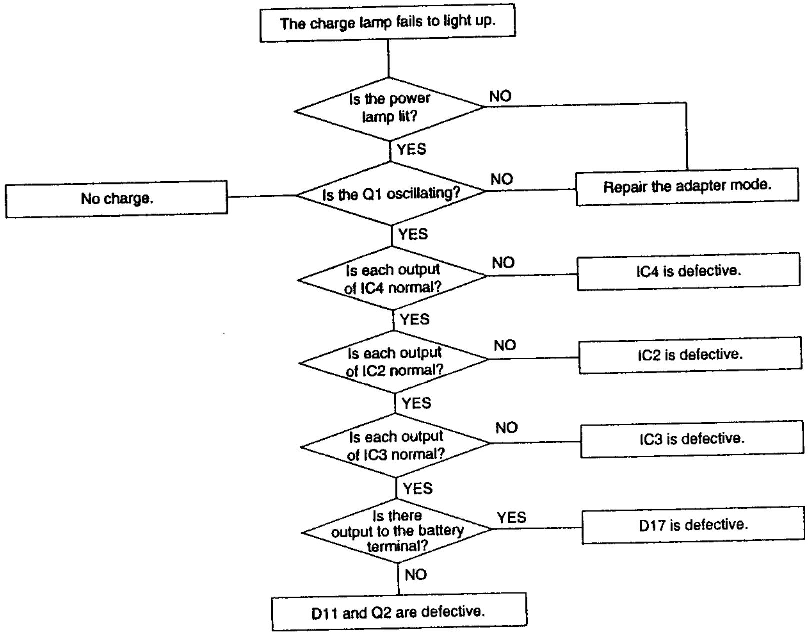
7. Display
Only the D16 (red LED) lights up in the adapter mode.
In the charge mode, D17 (orange LED) lights up together with D16 during quick charging. When quick charging is completed (in the trickle mode), only D17 goes out.
In the refresh mode, D16 lights, and D17 blinks. When the discharging is completed, the quick charging starts at once, and D17 begins to light stably.
D17 on-off is controlled through the pin 4 of IC3.

8. Discharge circuit
The discharging function in the refresh mode is enabled by the discharging resistors R44, R46 and R47 and the discharge circuit switch Q4.
The discharge current value is determined by the battery voltage and the resistance of the discharging resistor.
Here, the constant current control is not performed.
The discharge end voltage is judged at the pin 22 of IC3 by converting the voltage of the discharging battery with R38 and R41.

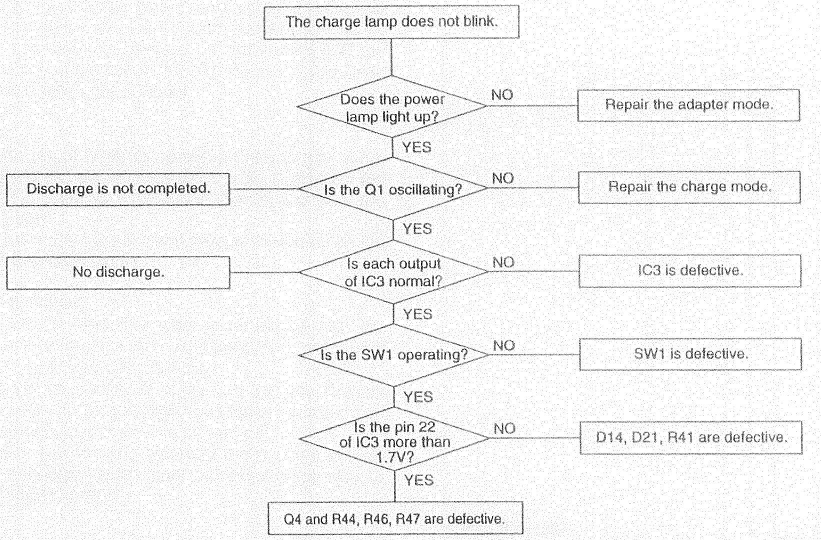
Adapter Mode


The power lamp fails to light up.
Check the fuse F1.
No operation.
Is the output voltage output?
YES
D9 is defective.
NO
Is the Q1 oscillating?
NO
Q1 and IC4 are defective.
YES
Is each output of IC4 normal?
NO
IC4 is defective.
YES
Is each output of IC2 normal?
NO
IC2 is defective.
YES
Is each output of IC3 normal?
NO
IC3 is defective.
YES
PC1, IC4, and CN2 are defective.

Charging Mode


The charge lamp fails to light up.
Is the power lamp lit?
NO
YES
No charge.
Is the Q1 oscillating?
NO
Repair the adapter mode.
YES
Is each output of IC4 normal?
NO
IC4 is defective.
YES
Is each output of IC2 normal?
NO
IC2 is defective.
YES
Is each output of IC3 normal?
NO
IC3 is defective.
YES
Is there output to the battery terminal?
YES
D17 is defective.
NO
D11 and Q2 are defective.

Refresh Mode


The charge lamp does not blink.
Does the power lamp light up?
NO
Repair the adapter mode.
YES
Discharge is not completed.
Is the Q1 oscillating?
NO
Repair the charge mode.
YES
No discharge.
Is each output of IC3 normal?
NO
IC3 is defective.
YES
Is the SW1 operating?
NO
SW1 is defective.
YES
Is the pin 22 of IC3 more than 1.7V?
NO
D14, D21, R41 are defective.
YES
Q4 and R44, R46, R47 are defective.

12-2. AC ADAPTER P.W.B.

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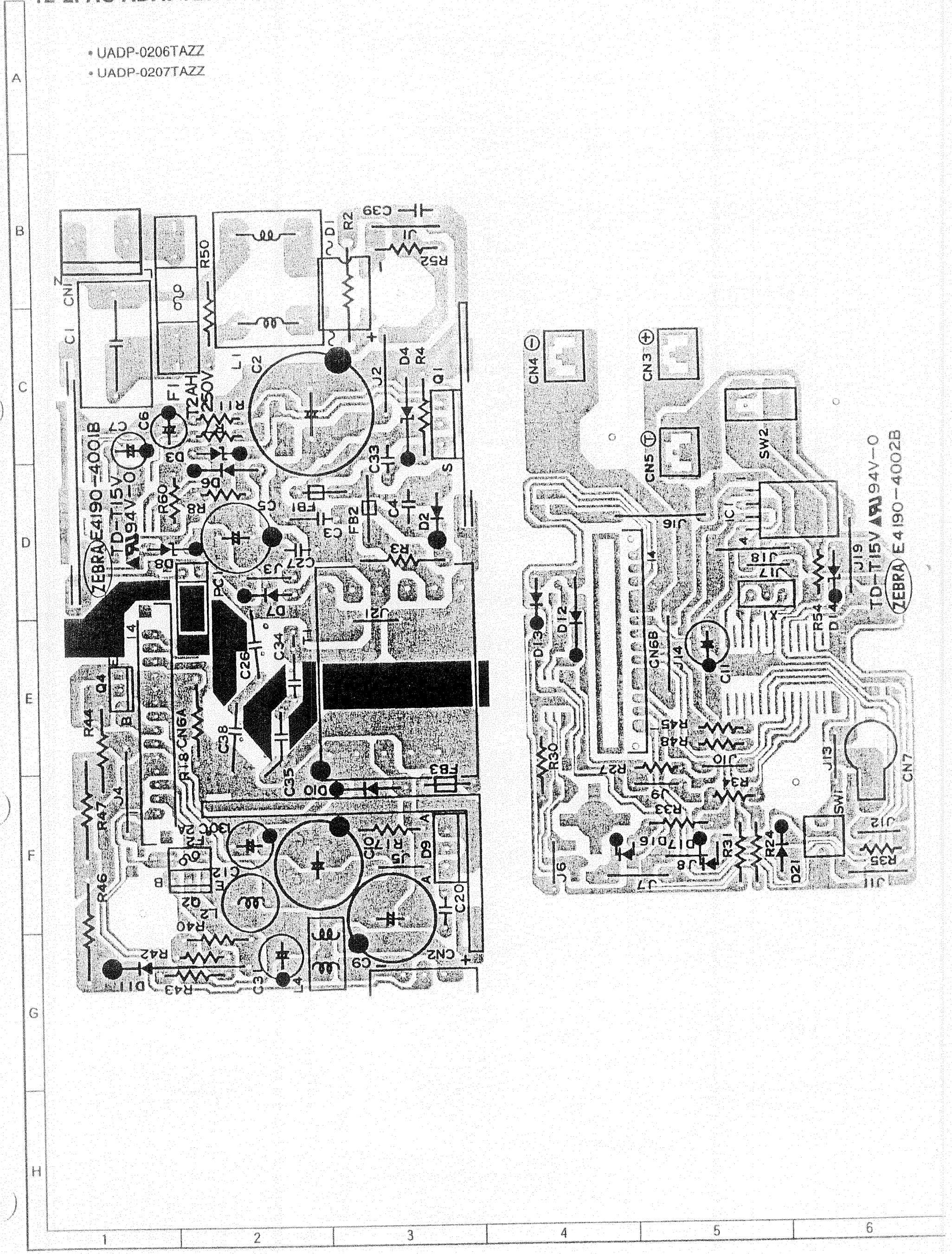
- UADP-0207TAZZ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ZEBRA E4190-4001B
TD-T15V
94V-0
F1 T2AH 250V
CN1
CN2
CN3
CN4
CN5
CN6A
CN6B
CN7
SW1
SW2
IC1
ZEBRA E4190-4002B
TD-T15V 94V-0

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The switching circuit drives the transistor Q1 to act as a switch by using the DC voltage rectified through C2 corresponding to the signals sent from the primary side control section. It and the transformer T1 comprise a high-frequency inverter.

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D11 is used to prevent discharge troubles of the control circuit section when the input is turned off with the battery attached.

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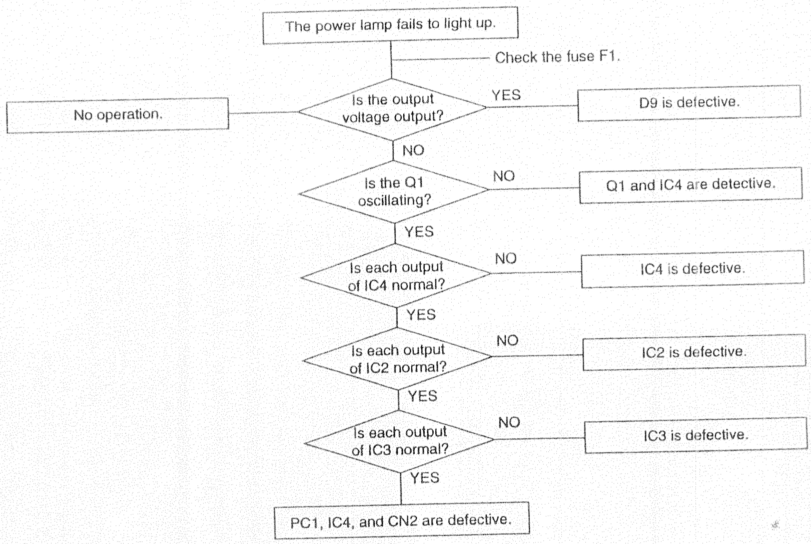
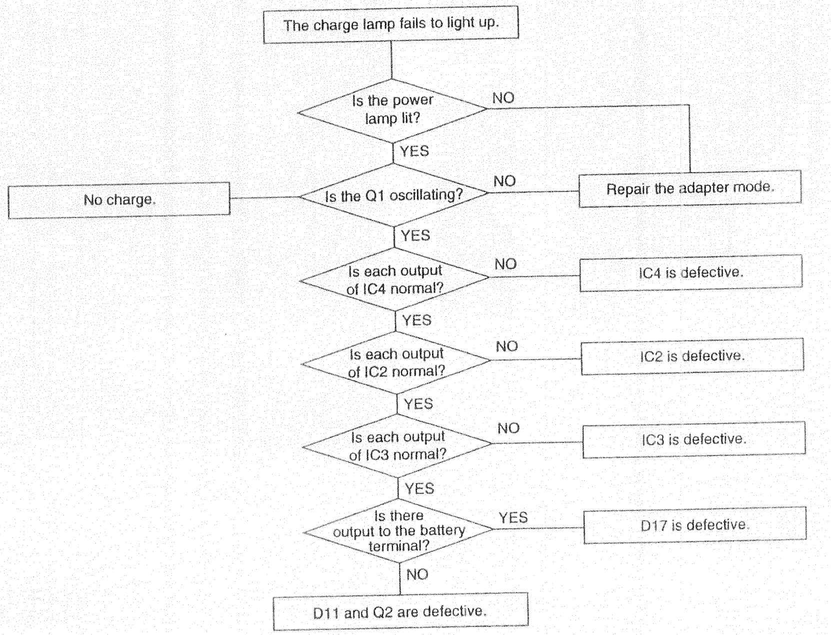
Adapter Mode

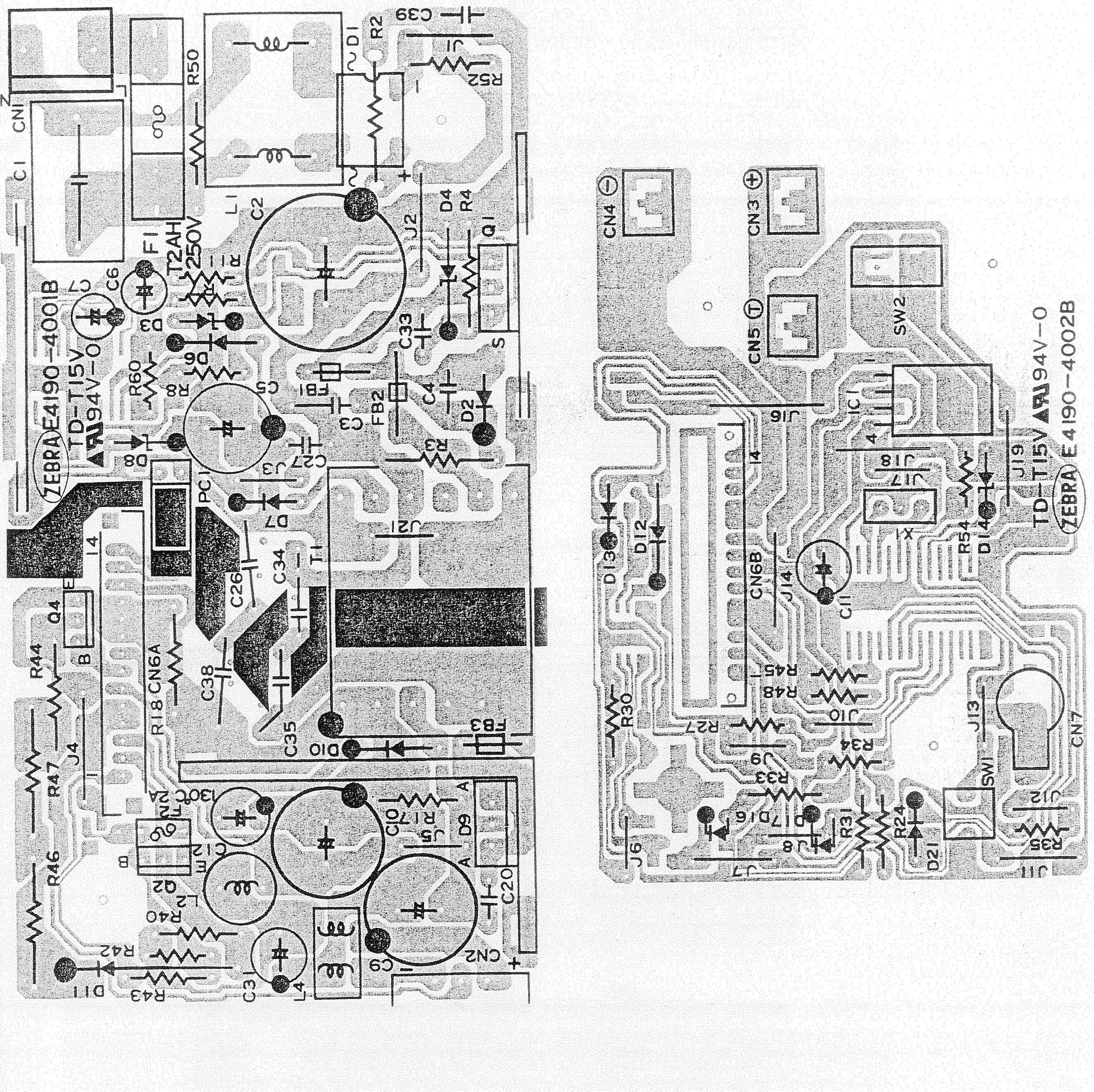

The power lamp fails to light up.
Check the fuse F1.
No operation.
Is the output voltage output?
YES
D9 is defective.
NO
Is the Q1 oscillating?
NO
Q1 and IC4 are detective.
YES
Is each output of IC4 normal?
NO
IC4 is defective.
YES
Is each output of IC2 normal?
NO
IC2 is defective.
YES
Is each output of IC3 normal?
NO
IC3 is defective.
YES
PC1, IC4, and CN2 are defective.

Charging Mode


The charge lamp fails to light up.
Is the power lamp lit?
NO
YES
No charge.
Is the Q1 oscillating?
NO
Repair the adapter mode.
YES
Is each output of IC4 normal?
NO
IC4 is defective.
YES
Is each output of IC2 normal?
NO
IC2 is defective.
YES
Is each output of IC3 normal?
NO
IC3 is defective.
YES
Is there output to the battery terminal?
YES
D17 is defective.
NO
D11 and Q2 are defective.

12-2. AC ADAPTER P.W.B.

- UADP-0206TAZZ
- UADP-0207TAZZ


CN1
C1
R50
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C2
D1
R2
C39
J1
R52
F1
T2AH
250V
C6
C7
D3
R1
J2
D4
R4
Q1
S
C33
R60
D6
R8
FB1
C5
C4
FB2
C3
D2
ZEBRA E4190-4001B
TD-T15V
94V-0
D8
C27
J3
R3
PC1
D7
J21
T1
14
C26
C34
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C35
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FB3
J4
R47
C30
C12
ZA
C10
R17
J5
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R46
Q2
L2
R40
C20
R42
C9
CN2
D11
R43
C31
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CN4
CN3
CN5
SW2
IC1
J16
J18
J17
J19
ZEBRA E4190-4002B
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94V-0
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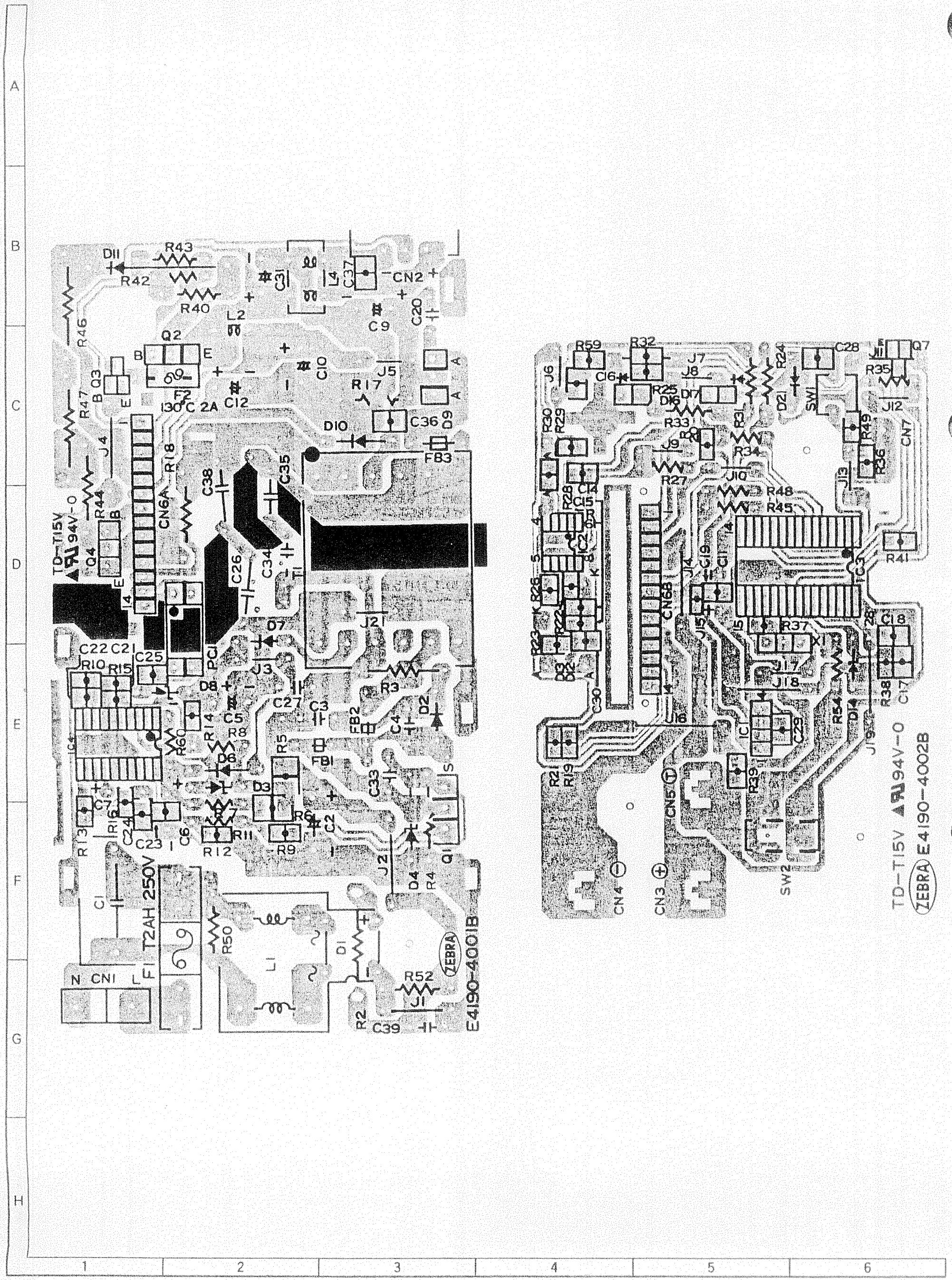
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E4190-4002B
T2AH 250V
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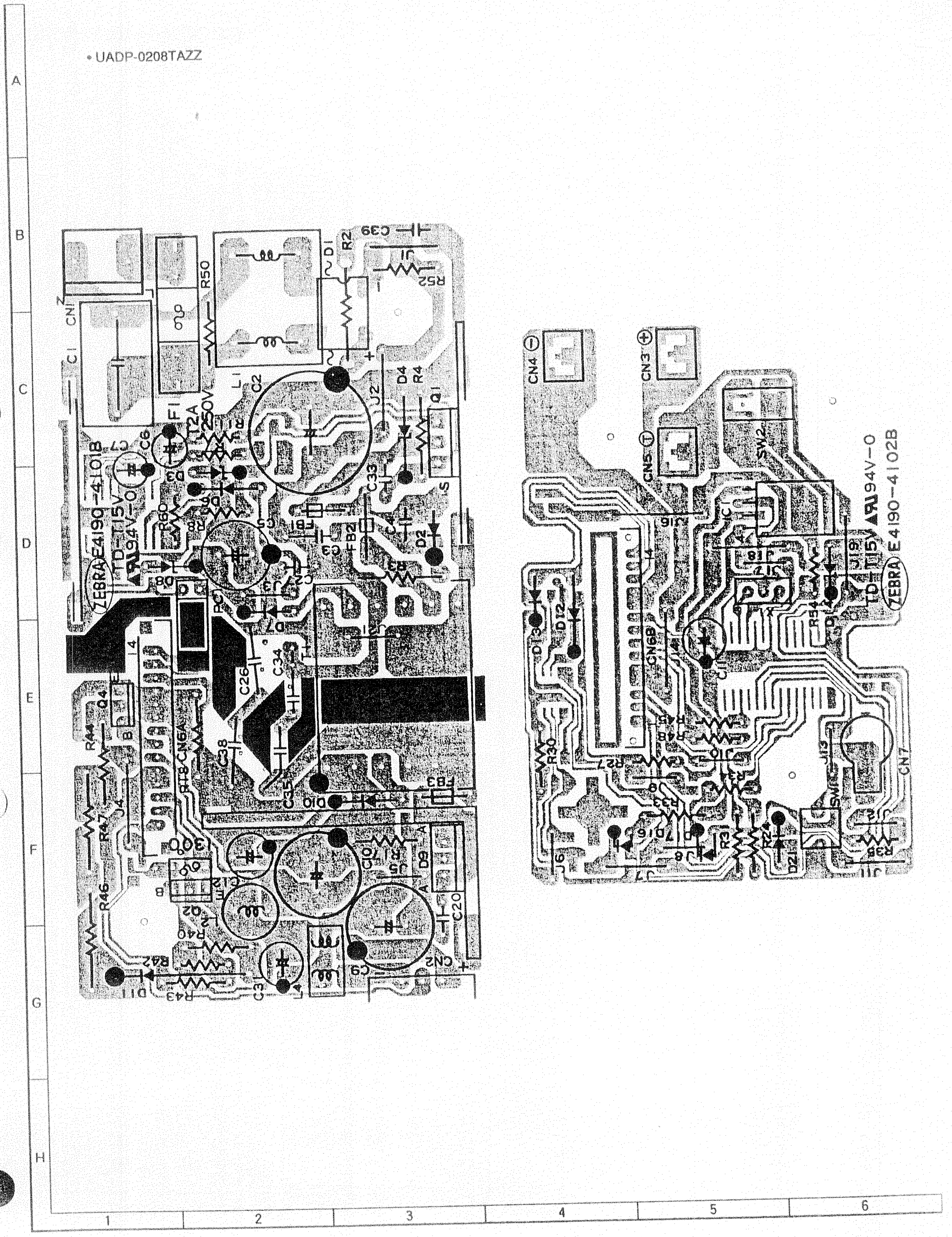
CN7
SW1
SW2

• UADP-0208TAZZ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CN7
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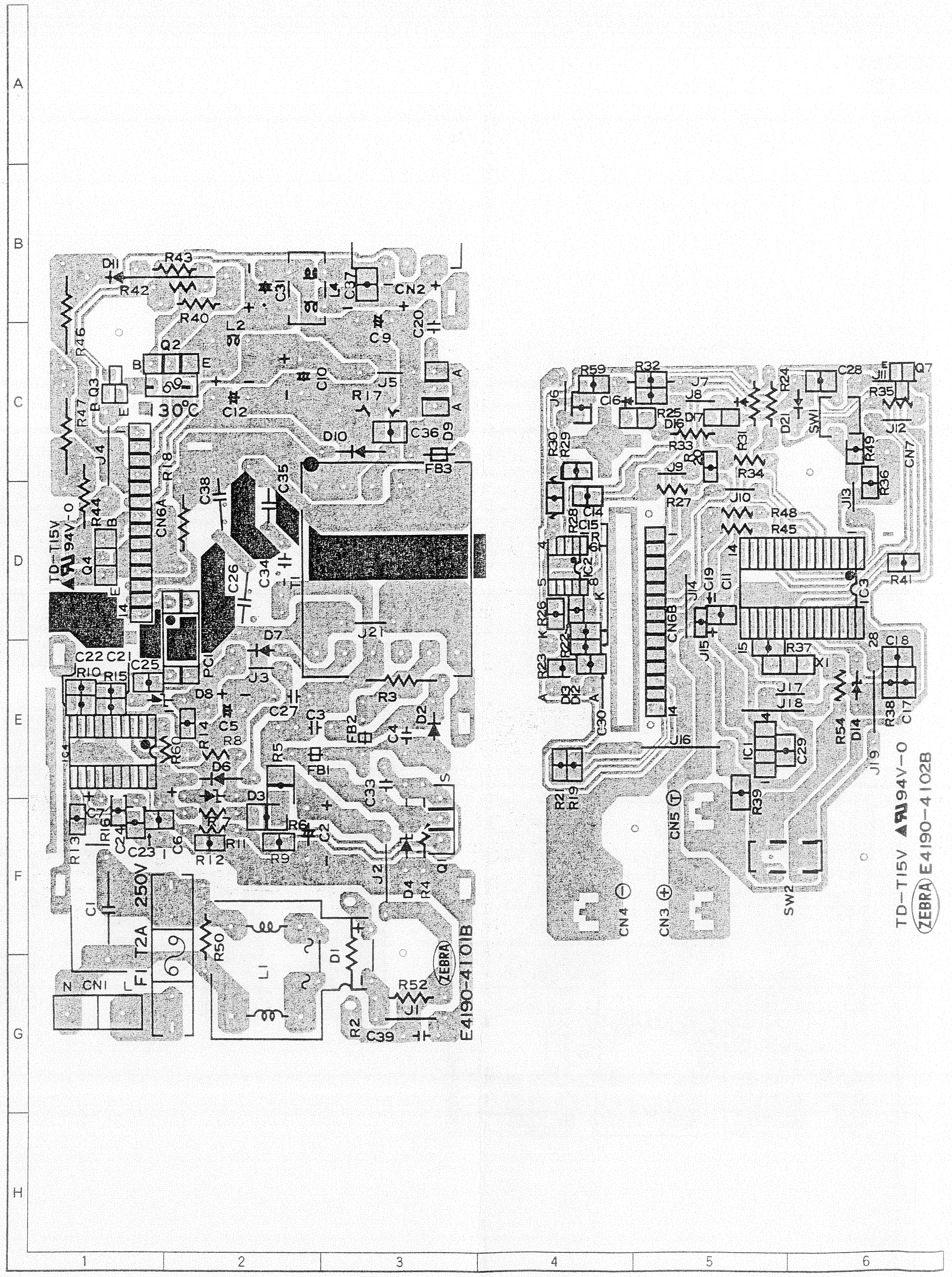
SW2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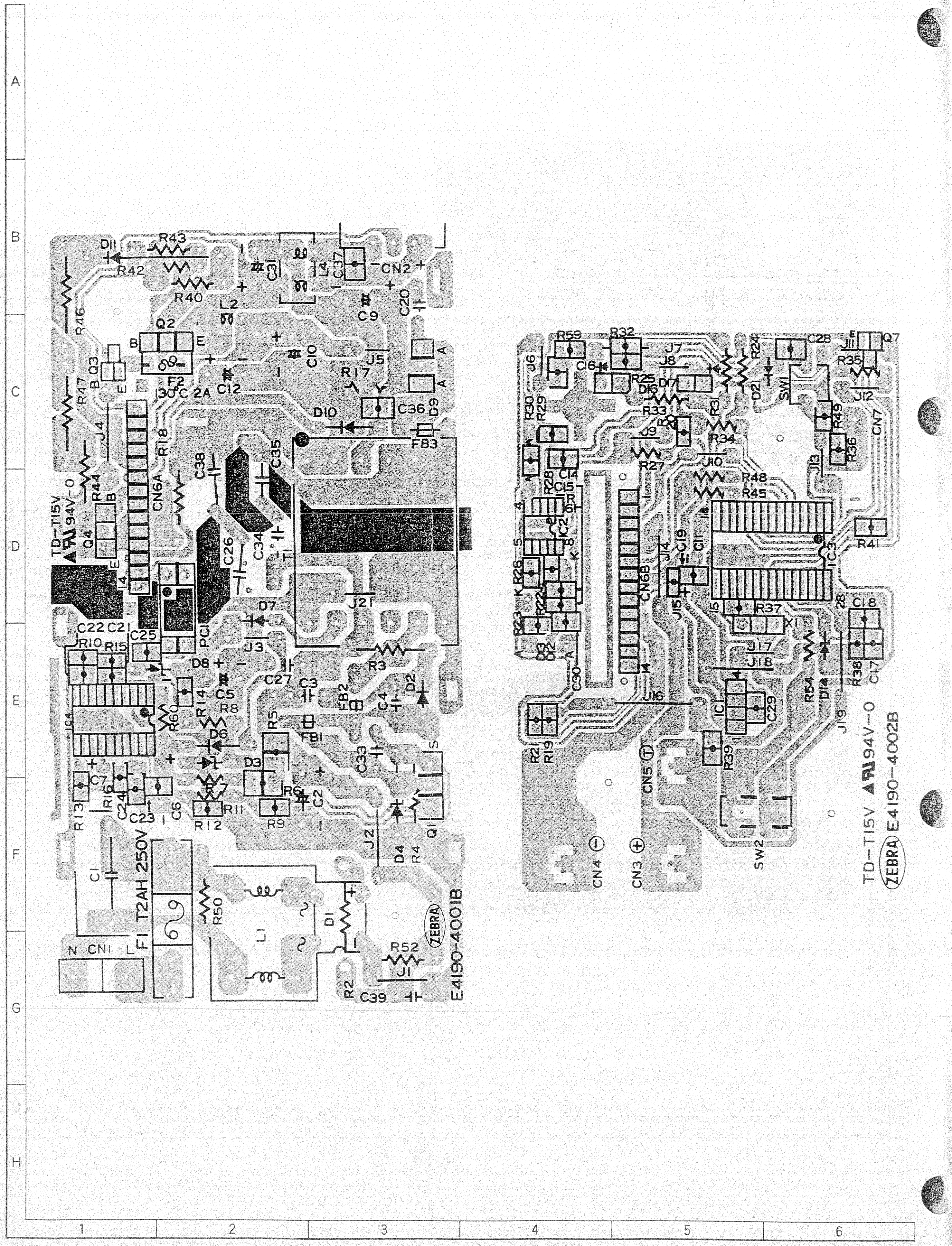
ZEBRA
E4190-4102B
CN1
CN2
CN3 ⊕
CN4 ⊖
CN5
CN6A
CN6B
CN7
T2A 250V
F1
L1
D1
R50
R52
J1
C39
R2
Q1
Q2
Q3
Q4
Q7
IC1
IC2
IC3
IC4
PC1
T1
FB1
FB2
FB3
SW1
SW2
X1
30°C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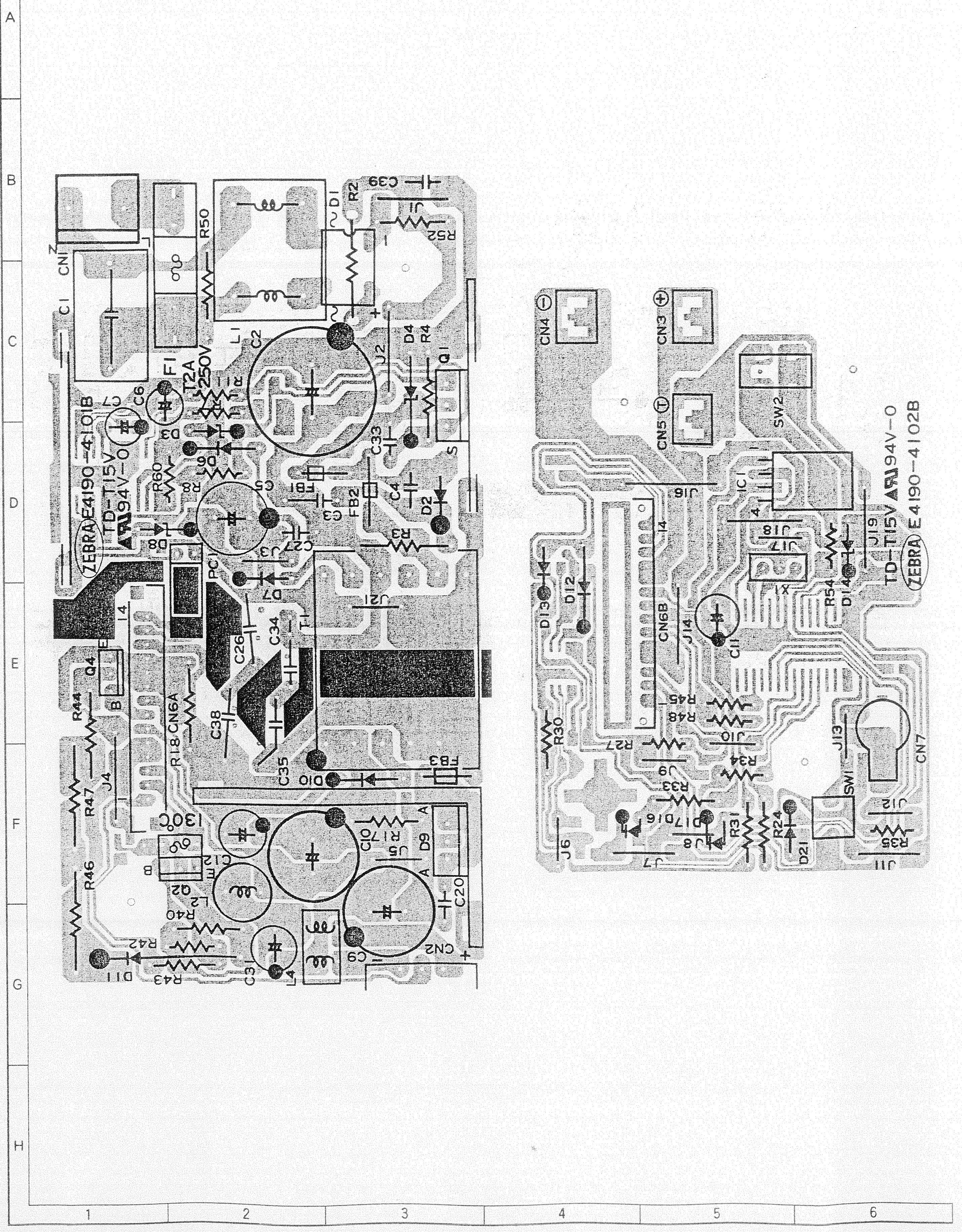
TD-T15V 94V-0
E4190-4001B
ZEBRA
TD-T15V 94V-0
ZEBRA E4190-4002B
CN1
CN2
CN3 ⊕
CN4 ⊖
CN5
CN6A
CN6B
CN7
SW1
SW2
T1
T2AH 250V

• UADP-0208TAZZ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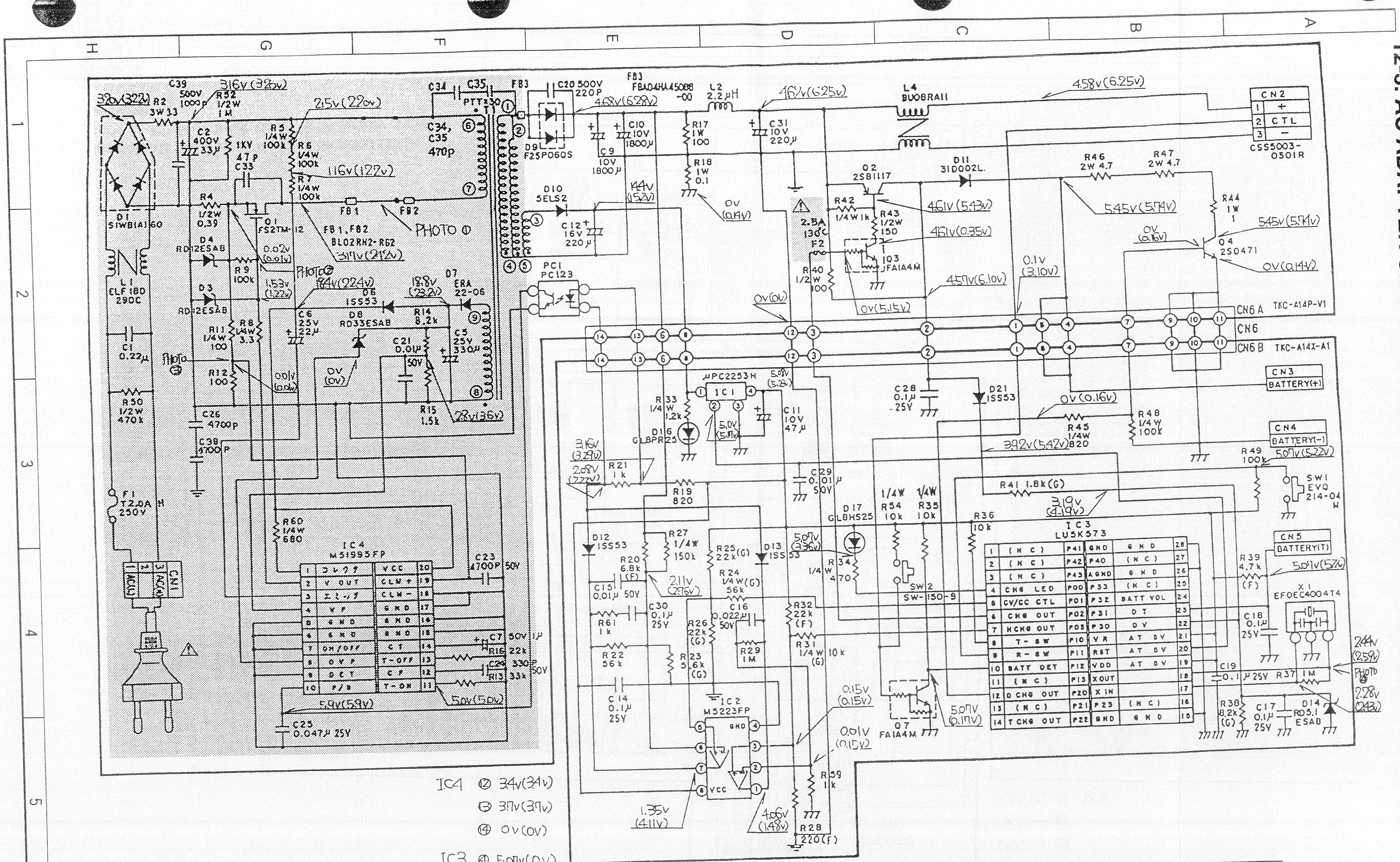
F
G
H
1
2
3
4
5
6
ZEBRA E4190-4101B
TD-T15V 94V-0
TD-T15V 94V-0
ZEBRA E4190-4102B
CN1
CN2
CN3 ⊕
CN4 ⊖
CN5
CN6A
CN6B
CN7
SW1
SW2
T2A 250V

12-3. AC ADAPTER CIRCUIT SCHEMATIC DIAGRAM (VL-E37S, E307S, E37H)



H
G
F
E
D
C
B
A
1
2
3
4
5
6
D1 S1WB(A)60
L1 ELF18D 290C
C1 0.22μ
R50 1/2W 470k
F1 T2.0A H 250V
CN1 1 AC(L) 3 AC(N)
C39 500V 1000p
R2 3W 33
R52 1/2W 1M
C2 400V 33μ
1KV 47p C33
R5 1/4W 100k
R6 1/4W 100k
R7 1/4W 100k
R4 1/2W 0.39
Q1 FS2TM-12
D4 RD12ESAB
D3 RD12ESAB
R9 100k
R11 1/4W 100
R8 1/4W 3.3
R12 100
C26 4700P
C38 4700P
C34, C35 470p
FB3
FB1 FB2
FB1, FB2 BL02RN2-R62
PHOTO ①
PHOTO ②
PHOTO ③
C6 25V 22μ
D6 1SS53
D8 RD33ESAB
D7 ERA 22-06
R14 8.2k
C21 0.01μ 50V
C5 25V 330μ
R15 1.5k
R60 1/4W 680
IC4 M51995FP
C23 4700P 50V
C7 50V 1μ
R16 22k
C24 330P 50V
R13 33k
C25 0.047μ 25V
C20 500V 220P
FB3 FBA04HA450BB -00
D9 F25P06QS
C10 10V 1800μ
C9 10V 1800μ
D10 5ELS2
C12 16V 220μ
PC1 PC123
L2 2.2μH
R17 1W 100
R18 1W 0.1
C31 10V 220μ
2.5A 130C F2
L4 BU08RA11
Q2 2SB1117
R42 1/4W 1k
R43 1/2W 150
IC3 JFA1A4M
R40 1/2W 100
D11 31D002L
R46 2W 4.7
R47 2W 4.7
R44 1W 1
Q4 2SD471
CN2 1 + 2 CTL 3 − CSS5003-0501R
CN6A TKC-A14P-V1
CN6
CN6B TKC-A14X-A1
CN3 BATTERY(+)
CN4 BATTERY(−)
CN5 BATTERY(T)
μPC2253H IC1
C11 10V 47μ
R33 1/4W 1.2k
D16 GL8PR25
C28 0.1μ 25V
D21 1SS53
R45 1/4W 820
R48 1/4W 100k
R49 100k
SW1 EVQ 214-04
R21 1k
R19 820
C29 0.01μ 50V
R41 1.8k(G)
D17 GL8HS25
R54 1/4W 10k
R35 1/4W 10k
R36 10k
IC3 LU5K573
D12 1SS53
R27 1/4W 150k
R20 6.8k (F)
C15 0.01μ 50V
R25 22k (G)
R24 1/4W (G) 56k
D13 1SS53
R34 1/4W 470
SW2 SW-150-9
R39 4.7k (F)
X1 EF0EC4004T4
C18 0.1μ 25V
C16 0.022μ 50V
R61 1k
C30 0.1μ 25V
R26 22k (G)
R29 1M
R32 22k (F)
R31 1/4W 10k (G)
R22 56k
R23 5.6k (G)
C14 0.1μ 25V
IC2 M5223FP
Q7 FA1A4M
C19 0.1μ 25V
R37 1M
R38 8.2k (G)
C17 0.1μ 25V
D14 RD5.1 ESAB
R59 1k
R28 220(F)

IC4 ⑫ 3.4v(3.4v)
⑬ 3.7v(3.7v)
⑭ 0v(0v)
IC3 ④ 5.07v(0V)
ⓒ 0v (5.23V)
ⓓ 5.07v (5.23v)
⑧ 5.07v (5.23V)

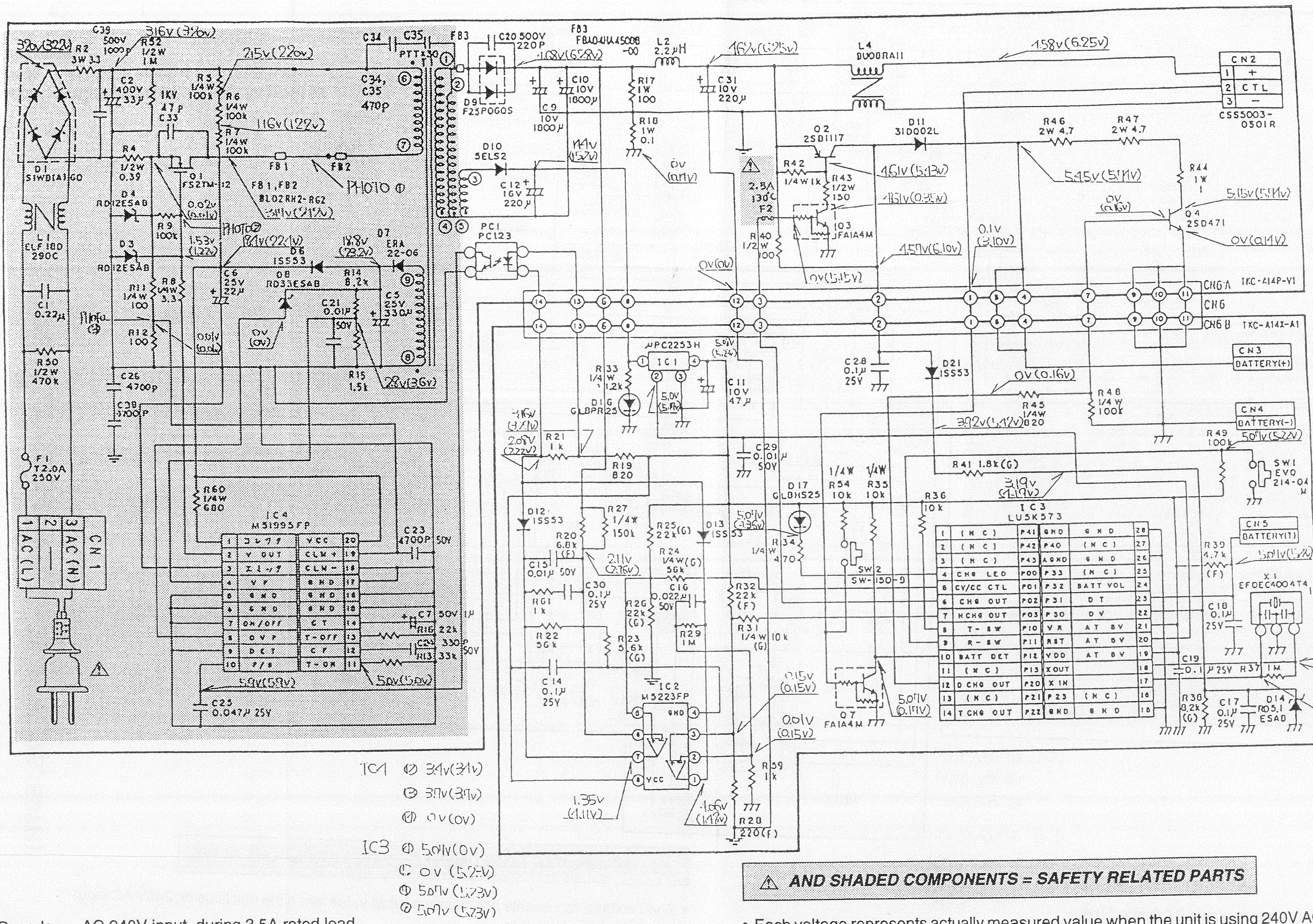
⚠ AND SHADED COMPONENTS = SAFETY RELATED PARTS

ADP mode ... AC 240V input, during 3.5A rated load
CHG mode ... AC 240V input, during 5.5A battery charging
(in parentheses)

CAUTION
*The AC plug configration varies depending on destinations.

- Each voltage represents actually measured value when the unit is using 240V AC input and 3.5A ADP output.
- Parenthesized figures represent voltage values when the battery is charged using 240V AC input and 1.5A current.
  Unit for resistor shall be Ω.
  Resistor not specified shall be 1/10W.
  Unit for capacitor shall be F.

VL-E37S/H/X
VL-E307S
AC ADAPTER CIRCUIT SCHEMATIC DIAGRAM (VL-E37X)


CN1
AC (L)
AC (N)
F1 T2.0A 250V
L1 ELF18D 290C
C1 0.22μ
R50 1/2W 470k
D1 S1WBA60
C39 500V 1000P
R2 3W 3.3
R52 1/2W 1M
C2 400V 33μ
R3 1/4W 100k
R6 1/4W 100k
R7 1/4W 100k
C33 1KV 47P
Q1 FS2TM-12
R4 1/2W 0.39
D4 RD12ESAB
D3 RD12ESAB
R9 100k
R11 1/4W 100
R8 1/4W 3.3
R12 100
C26 4700P
C38 4700P
R60 1/4W 680
IC4 M51995FP
C23 4700P 50V
C7 50V 1μ
R16 22k
C24 330P 50V
R13 33k
C25 0.047μ 25V
C6 25V 22μ
D8 RD33ESAB
D6 1SS53
R14 8.2k
C21 0.01μ 50V
C5 25V 330μ
R15 1.5k
D7 ERA 22-06
FB1, FB2 BL02RN2-R62
C34, C35 470P
PT1 30
FB3 FBA04HA450BB -00
C20 500V 220P
D9 F25P060S
C9 10V 1000μ
C10 10V 1000μ
D10 5ELS2
C12 16V 220μ
PC1 PC123
L2 2.2μH
R17 1W 100
R18 1W 0.1
C31 10V 220μ
L4 DU00RA11
F2 2.5A 130°C
R40 1/2W 100
R42 1/4W 1k
Q2 2SD1117
R43 1/2W 150
IC3 JFA1A4M
D11 31D002L
R46 2W 4.7
R47 2W 4.7
R44 1W 1
Q4 2SD471
CN2
+
CTL
−
CSS5003-0501R
CN6-A TKC-A14P-V1
CN6
CN6-B TKC-A14X-A1
CN3 BATTERY(+)
CN4 BATTERY(−)
CN5 BATTERY(T)
μPC2253H IC1
R33 1/4W 1.2k
D16 GL0PR25
C11 10V 47μ
C28 0.1μ 25V
D21 1SS53
R48 1/4W 100k
R45 1/4W 820
R49 100k
SW1 EVQ 214-04
R21 1k
R19 820
C29 0.01μ 50V
R41 1.8k (G)
D17 GL0HS25
R54 1/4W 10k
R35 1/4W 10k
R36 10k
IC3 LU5K573
D12 1SS53
R27 1/4W 150k
R20 6.8k (F)
R25 22k (G)
D13 1SS53
R34 1/4W 470
SW2 SW-150-9
C15 0.01μ 50V
C30 0.1μ 25V
R24 1/4W (G) 56k
C16 0.022μ 50V
R32 22k (F)
R31 1/4W 10k (G)
RG1 1k
R26 22k (G)
R29 1M
R22 56k
R23 5.6k (G)
C14 0.1μ 25Y
IC2 M5223FP
GND
VCC
Q7 FA1A4M
R59 1k
R28 220 (F)
R39 4.7k (F)
X1 EFOEC4004T4
C18 0.1μ 25V
C19 0.1μ 25V
R37 1M
R38 8.2k (G)
C17 0.1μ 25V
R05.1
D14 ESAD
PHOTO

1	(N C)	P41	GND	GND	28
2	(N C)	P42	P40	(N C)	27
3	(N C)	P43	AGND	GND	26
4	CHG LED	P00	P33	(N C)	25
5	CV/CC CTL	P01	P32	BATT VOL	24
6	CHG OUT	P02	P31	DT	23
7	NCHG OUT	P03	P30	DV	22
8	T-SW	P10	VR	AT BY	21
9	R-SW	P11	RST	AT BY	20
10	BATT DET	P12	VDD	AT BY	19
11	(N C)	P13	XOUT		18
12	D CHG OUT	P20	XIN		17
13	(N C)	P21	P23	(N C)	16
14	T CHG OUT	P22	GND	GND	15

	1	2	3	4	5	6
H						
G						
F						
E						
D						
C						
B						
A						

IC1 ⑦ 3.4v(3.4v)
⑧ 3.7v(3.7v)
⑪ 0v(0v)

IC3 ④ 5.0v(0v)
⑤ 0v (5.23v)
⑩ 5.07v (5.23v)
⑳ 5.07v (5.23v)

ADP mode ... AC 240V input, during 3.5A rated load
CHG mode ... AC 240V input, during 5.5A battery charging
(in parentheses)

CAUTION
*The AC plug configration varies depending on destinations.

⚠ AND SHADED COMPONENTS = SAFETY RELATED PARTS

- Each voltage represents actually measured value when the unit is using 240V AC input and 3.5A ADP output.
- Parenthesized figures represent voltage values when the battery is charged using 240V AC input and 1.5A current.
  Unit for resistor shall be Ω.
  Resistor not specified shall be 1/10W.
  Unit for capacitor shall be F.